

Engaging Peer Mentors in Freshmen Programs

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Abstract - The STEM Talent Expansion Program (STEP) at Louisiana State University (LSU) was designed to increase the number of engineering and construction management graduates through retention programs aimed at: 1) developing and maintaining a sense of community among the students and faculty; 2) enhancing academic skills of the students; and 3) providing a framework for interactions between faculty, students and industry personnel. One third of the freshmen class (approximately 400 students) participates in at least one of the freshmen programs developed to ease a student's transition from high school into the university. The three featured programs include: *Encounter Engineering*, a summer bridge camp hosted the week prior to the start of school, *ENGR 1050 Introduction to Engineering*, freshman class, and the Engineering Residential College (ERC), a designated residential hall specifically for 1st year College of Engineering majors. The class and camp include design projects, team building exercises and meeting industry professionals. The ERC helps students connect with other freshmen through living together. All of the programs introduce freshmen to engineering faculty and staff, have student organization activities and provide insight into the engineering disciplines and subsequent careers.

A significant lesson learned from the camp and intro course is the strong, positive influence of peer mentoring and its effect on retention. Peer mentors are upper-level, college of engineering majors. Freshmen in the camp and the class are grouped in teams and assigned a peer mentor based on their major. Peer mentors offer advice, oversee design projects, discuss internships and student organizations, and guide freshmen students through their first semester. The peer mentors serve as college ambassadors for special events, help recruit for the college, and perform hands on demonstrations in outreach to the K-12 community. Their newly founded Society of Peer Mentors was recently named Most Outstanding New Student Organization on LSU's campus.

Success of the STEP program has been measured through a longitudinal study of all freshmen declaring engineering as a major. Retention and persistence numbers of these students in the college of engineering, STEM fields and in the university are

recorded on the 14th day of each fall semester. Completing its sixth year of activities in 2012, STEP freshmen participant retention and cumulative six year graduation (CGR6) rates surpass the non-participant population by 15-20% and 10% respectively. Peer Mentor CGR6 rates are 35% higher than non-STEP students.

Index Terms – Bridge camp, Freshmen programs, Peer Mentoring, Retention

INTRODUCTION

In 2007, the LSU College of Engineering was awarded an NSF STEP grant aimed at improving early retention rates for college of engineering majors, and subsequent cumulative six year graduation rates (CGR6). Adapting strategies shown to be effective in the literature [1-9], programs were developed seeking to ease high school to college transition for incoming freshmen. As reported in the research, helping freshmen establish a connection, a sense of community with continuing students, faculty and staff is key to improving retention.

The STEP program began modestly with a bridge camp, introduction to engineering course, a residential college, and incorporated a faculty development component. Successes in the first few years have fostered support for growing the programs [10-12] which now include a summer camp, general freshman introductory class, two new discipline specific freshman classes, high school robotics outreach, supplemental instruction, general community outreach, recruiting and a student organization called the Society of Peer Mentors (SPM). The focus of this manuscript is the Peer Mentors and their involvement in each of the other freshmen program components listed.

For tracking retention and other data purposes, students participating in one of the freshmen or transitional programs are coded as "STEP." Those who do not participate are coded as "non-STEP." Cohorts are defined based on the initial year of entry to LSU.

PROGRAM OVERVIEW

In 2007, the *Encounter Engineering* (E²) camp began with five Peer Mentors (PM's) and 45 incoming freshmen. In fall 2013, the camp has grown to accommodate 200 incoming freshmen and 73 mentors. To manage this growth, a

hierarchical structuring of the PM is utilized. Fifty PM stay directly engaged with the incoming freshmen protégés as they are assigned to lead teams of four. The teams are then collectively arranged into five groups of 10. Each group is assigned two additional PM's to serve as PM Leaders. The leaders help with distribution of materials, information and generally troubleshoot problems for the teams allowing the PM to stay with their protégés. The more senior, experienced PM Leaders are allowed to direct and facilitate four of the camp professional skills sessions: design, the seven habits of highly effective engineering students, communication, and a university technology seminar. Each of these sessions has two PM leaders as well as three other PM to coordinate the logistics of the camp. Freshmen evaluations of the bridge camp activities and sessions from 2007-2012 consistently indicate that the interaction with the peer mentors is the highest ranked aspect of the camp.

Because of the success of the mentors in the camp, in 2010, mentors from every engineering discipline were incorporated into the Introduction to Engineering freshmen course, ENGR 1050, as "teaching assistants." The course is an introductory engineering course that outlines some of the possible careers in engineering, introduces the freshmen to the different majors at LSU, teaches communication and design using team projects, and culminates in a design project at the end of the semester.

The structure of the class forces students to actively work in groups. The freshman are grouped together and assigned projects: one research and one design based project. These groups are led and taught by a peer mentor of the same or relating discipline to each group. Additionally, the presidents of different engineering organizations speak in class regularly to help involve the students further in the College of Engineering. The class aims to give each student more individual attention, helping them to understand what will help them thrive as an engineering student. The peer mentors pass on their knowledge of the campus and work closely with the freshman in the course. In so doing, the freshmen are building relationships with upperclassmen. The model for this class has been so successful that the electrical engineering and industrial engineering departments at LSU have created a class similar in structure to ENGR 1050. These classes plan to utilize peer mentors in the STEP program to provide individualized instruction.

In line with the design mentoring aspect of the E² camp and ENGR 1050, the STEP Robotics Mentoring program pairs engineering students at LSU with local middle, and high school FIRST robotics teams. A student may enter this mentoring program his or her first semester at LSU. The purpose of this program is to encourage STEM disciplines at an early age and to give current engineering students hands-on design experience. STEP currently supports two different competitions: the FIRST LEGO League competition and the FIRST Robotics Competition. This facet of the STEP peer mentoring program helps students gain valuable design, leadership, and

communication skills while, at the same time, promoting engineering education to a younger audience.

The design project itself is the design and construction of a robot. The mentors provide direction for these K-12 students to help them complete their design in a timely manner. The success of the project is largely influenced by the mentors input and suggestions, requiring the peer mentors to develop and demonstrate leadership skills. By helping students design and construct a robot to perform a specific task, mentors are able to apply what they have learned in their courses to the design. Ultimately, mentors reinforce that knowledge and further their understanding of the engineering design process. Overall, the STEP Robotics Mentoring program serves as an opportunity to improve the skills that make mentors successful throughout their careers in industry or academia and encourages engineering education at a young age.

PEER MENTOR SELECTION & ORGANIZATION

The peer mentor selection process and leadership hierarchy have been developed over the past several years. The selection process begins with an online application. The student organization leadership reviews this application. Once the application is approved, the student is asked to interview. The interview is generally a 15-minute process that serves to ascertain the leadership ability of the student and is administered by three current leaders in the Society of Peer Mentors. He or she is asked a series of questions about his or her history of leadership, the reason for wanting to be a mentor and a variety of situational questions directly related to peer mentoring. Students who pass this stage are then suggested to the program director by the interviewers. The program director makes the final decision as to who is hired. Approximately ½ of the peer mentors employed have at one point participated themselves in a facet of the STEP program.

With the increase in the number of students and the diversity of the programs that mentors are actively engaged, the STEP program needed to have a way for each of these facets to come together. The student organization, the Society of Peer Mentors (SPM), was created to provide a sense of community for different sectors within the program. Initially leaders were selected by the program director based on attitude, seniority and expressed interest in a program aspect. Leaders will be elected for the first time Fall 2014.

By meeting monthly, the student organization allows for mentors in each of the facets of the program to explain what the mentors in that concentration of the program did. Twice a year the society requires its' members to participate in 4-hour training sessions that help teach mentors valuable skills that help them grow professionally like how to be an effective leader. For the 2013-2014 school year, the student organization plans on having two leadership development workshops for the officers of the organization. Each workshop focuses around an activity that

the students find enjoyable: rock climbing in the fall, and paintball in the spring. Additionally, there will be SPM intramural teams, tailgates at the football games, and camping trips. Each of these activities promotes the SPM community and involvement of new members, and, in turn, increases the retention of the students in the program.

The promotion of leadership in engineering undergraduates is the one of the goals of the student organization. As such, SPM provides the underlying structure of the students in the STEP program. The structure of SPM is that there are two heads of each department of the program. The students who work in each area report directly to these heads. To organize the entire student organization, there are also SPM officers to whom these heads report. The president and vice president communicate directly to the STEP director.

To provide an incentive for students to participate in multiple aspects of the program, and to participate in outreach for the LSU College of Engineering, a point system was developed. Logically, to become the head of a department of the program, a student must be an active participant in a particular program. Additionally, to become an officer within SPM, the student must be active in the organization. The minimum requirement to run for office in the organization is that the student participates in, at least, one area of the organization, attends meetings regularly, and participates in at least four outreach events for the College of Engineering. Peer mentors represent the leadership of the college, with the majority of the professional organization and student government leaders participating in the program.

RESULTS

The STEP program tracks longitudinally the students in the freshmen program. Retention results for the first 5 cohorts are presented in Charts 1& 2. The results indicate that students that participated in a freshmen program were retained and graduated at a higher percentage than students who did not. The focus groups of freshmen and evaluations at the end of the programs and course show that one of the primary influences on the freshmen are the interactions with the peer mentors.

Since ½ of the peer mentors initially started in a freshmen program, the STEP program began comparing the retention and graduation rates of those students involved in peer mentoring and those who do not participate to see the impact of the STEP program. The graduation rates of the peer mentors who began working for the program in 2007-2008 were used. Expected graduation is based on the academic standing of current students as well as if they have declared their graduation date.

The results from the students participating in the peer mentoring program were better than expected. Out of 53 students beginning in 2007-2008, 43 graduated within six years. This translates to a graduation rate of 81%. Three of the aforementioned students graduated in majors not included in the College of Engineering at LSU. If the

students planning on graduating by May 2014 are included, which is the fifth year of study for the majority of students beginning the program 2009, 90 students are expected to graduate. One hundred eleven (111) students have worked for STEP since 2007; thus, the graduation rate remains the same at 81%. For comparison, the average 6-year graduation rate for students not participating in the STEP program is approximately 45% and 55-60% of STEP freshmen.

Additionally, the mentoring program positively affected the K-12 students who participated in outreach activities the program sponsors. Of the six graduating seniors from the Woodlawn High School robotics program, all six are planning on majoring in engineering. Three out of 4 seniors from Parkview High School are going into STEM fields; two will be at LSU in mechanical engineering and one will be at another university in computer science.

CONCLUSION AND FUTURE PLANS

Overall the freshmen programs have met the goal set in the STEP grant's original proposal. The programs were designed based on research and proven techniques; however those techniques were modified to fit the culture at LSU. Over the past 6 years, the retention within the College of Engineering for the freshmen year increased from an historical average 70% to approximately 80% (for the participants in the program). Non participants' retention was the historical average, +/- 3%.

Unanticipated results of data from the freshmen indicated that the peer mentors made a huge difference in the attitudes and impressions on the incoming students. Although the STEP program did not initially have support of the upperclassmen in the proposal, modifications were made to include the tracking of retention and attitudes of the upperclassmen. The retention of the peer mentors who joined in their sophomore years was higher than their peers and the graduation rates for students involved as peer mentors in the program exceed the six year graduation rate by close to 35%. Based on the success of the peer mentor program, a subsequent grant was awarded by NSF to expand the program, assist in sophomore level classes and to assist with transfer students.

The follow-up STEP grant builds on the success of the mentor program by implementing mentors as "Assistant Instructors." This position was created based on pedagogical research data and the use of Supplemental Instructors (SI) that work for the Center for Academic Success at LSU. SI's provide instruction outside of the classroom for a variety of departments throughout the university that have been historically challenging for the majority of students. Assistant Instructors work closely with the SI program, but are specific to sophomore level engineering classes. The main goals of Assistant Instructors are to utilize active learning techniques outside classroom instruction in engineering classes with high DWF (Drop, Withdraw, Fail) rates and, in turn, increase retention rates of the students enrolled as well as the instructors.

Six peer mentors were hired this past spring for five courses: statics, thermodynamics, dynamics, circuits, and introduction into electrical engineering for non-majors. Three of the students will continue through the summer preparing manuals for their respective courses, instructing classes and training new AI's for the fall semester.

In conclusion, the STEP program will continue to utilize and expand the peer-mentoring program and training as determined by focus groups and shareholder expectations. The data indicates that the peer mentor program is the most successful of the LSU STEP programs.

Chart 1. STEP retention in the College of Engineering

Cohort	5 year	4 year	3 year	2 year	1 year
1	56.2%	67.2%	68.2%	74.4%	75.0%
2		53.1%	58.2%	63.0%	79.3%
3			56.8%	66.1%	74.4%
4				68.2%	87.9%
5					74.1%
Average	56.2%	58.5%	60.0%	67.3%	78.4%
Historical	41.4%	42.8%	45.7%	54.6%	73.3%

Chart 2. Non-STEP retention in the College of Engineering

Cohort	5 year	4 year	3 year	2 year	1 year
1	47.6%	47.1%	51.4%	59.0%	70.1%
2		46.7%	52.4%	56.4%	71.4%
3			47.3%	57.3%	64.0%
4				55.4%	82.3%
5					83.4%
Average	47.6%	46.9%	50.6%	57.1%	75.0%
Historical	41.4%	42.8%	45.7%	54.6%	73.3%

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